

CLAIMS

[Claim(s)]

[Claim 1] A flame retardant resin composition which blends 45 to phosphorus series flame retardant 100 weight section, and ten to isocyanuric derivative 30 weight section to high-density-polyethylene 100 weight section.

[Claim 2] The flame retardant resin composition according to claim 1 which furthermore carries out 1-5 weight-section combination of the hydrotalcite to high-density-polyethylene 100 weight section.

[Claim 3] Mold goods which fabricate the flame retardant resin composition according to claim 1 or 2.

Detailed Description of the Invention]

[0001]

[Field of the Invention] It is made for this invention to have fire retardancy equivalent to especially a rigid-polyvinyl-chloride resin material, a mechanical strength, and hardness about the flame retardant resin composition of a non halogen system.

[0002]

[Description of the Prior Art] Since it is obtained by blending stabilizer and a little plasticizers with vinyl chloride resin, it has cheap and moderate fire retardancy and a mechanical strength and hardness are excellent, the rigid-polyvinyl-chloride resin material has been widely used for wrapping, a pipe, a machine part, general merchandise, etc. However, since harmful halogenated compounds, such as dioxin, generate it when this rigid-polyvinyl-chloride resin material carries out incineration disposal of this, and it has an adverse effect on environment, that use is being improved.

[0003] For this reason, development of the flame retardant resin composition of a non halogen system is furthered as alternate material of the conventional rigid-polyvinyl-chloride resin material. As this non halogen system flame retardant resin composition, metal hydroxide, such as magnesium hydroxide, is blended with olefin system polymer, such as an ethylene-vinylacetate copolymer and an ethylene-ethyl acrylate copolymer, so much, While giving about the same fire retardancy as vinyl chloride resin, generating of the halogenated compound at the time of combustion is suppressed.

[0004] However, if it is in the flame retardant resin composition of this combination presentation, the compatibility of olefin system polymer and a lot of metal hydroxide runs short, the characteristics, such as elongation at the time of a fracture, flexural strength, and hardness, are inferior, and it cannot be satisfied with the alternate material of a rigid-polyvinyl-chloride resin material at all. For this reason, although what carried out the surface treatment of the metal hydroxide particle surface with higher fatty acid, such as a silane coupling agent and stearic acid, is blended as metal hydroxide and improving the compatibility of olefin system polymer and metal hydroxide is also made, it cannot still be satisfied.

[0005]

[Problem(s) to be Solved by the Invention]Therefore, the technical problem in this invention has fire retardancy equivalent to a rigid-polyvinyl-chloride resin material, a mechanical strength, and hardness, and there is in obtaining the flame retardant resin composition which does not generate a halogenated compound at the time of combustion.

[0006]
[Means for Solving the Problem]This technical problem is solvable to high-density-polyethylene 100 weight section with a flame retardant resin composition which blended 45 to phosphorus series flame retardant 100 weight section, and ten to isocyanuric derivative 30 weight section. 1-5 weight-section combination of the hydrotalcite may be carried out to high-density-polyethylene 100 weight section.

[0007]
[Embodiment of the Invention]Hereafter, this invention is explained in detail. High density polyethylene is used for base polymer of the flame retardant resin composition of this invention. In this high density polyethylene, density $0.94\text{--}0.965\text{g/cm}^3$, the thing of the melt flow rates (the temperature of 190°C , 2.16 kg of load, time 10 minutes) 0.01-10 is used -- several -- copolymerization of the alpha-olefin monomers, such as propylene not more than mol %, 1-butene, and 1-hexene, may be carried out.

[0008]Mechanical properties, such as a mechanical strength and hardness, resemble vinyl chloride resin closely, and high density polyethylene is preferred as base polymer of the resin composition used as the alternate material of a rigid-polyvinyl-chloride resin material. For this reason, base polymer of the flame retardant resin composition of this invention does not need to consist only of high density polyethylene in principle, and does not need to blend other olefin system polymer.

[0009]The phosphorus series flame retardant as fire retardant is blended with the base polymer which consists of this high density polyethylene. This phosphorus series flame retardant is fire retardant of a non halogen system which gives high fire retardancy to a resin composition. As a phosphorus series flame retardant, although one sort, such as ammonium polyphosphate, melamine phosphate, guanidine phosphate, melamine polyphosphoric acid, and phosphoric ester, or two sorts or more are specifically used, ammonium polyphosphate is especially the most desirable. These phosphorus series flame retardants can also improve the compatibility over high density polyethylene of base polymer using what carried out the surface treatment by the silane coupling agent.

[0010]Although the loadings of this phosphorus series flame retardant are defined with the degree of fire retardancy required of this flame retardant resin composition, In order equivalent to a rigid-polyvinyl-chloride resin material or to give the fire retardancy beyond it, Since a mechanical property will fall if it is considered as 45 or more weight sections to high-density-polyethylene 100 weight section of base polymer and 100 weight sections are exceeded, it is preferably considered as the range of 50 to 70 weight section 45 to 100 weight section.

[0011]An isocyanuric derivative is blended as a fire-resistant auxiliary agent. As this isocyanuric derivative, specifically Allylisocyanuric acid, Allyldiaminoisocyanuric acid etc. are used, and these compounds are fire retardant of a non halogen system which shows high fire retardancy similarly, and can give high fire retardancy synergistically to a resin composition by combining with the above-mentioned phosphorus series flame retardant. Ten to 30 weight section, preferably, the loadings of this isocyanuric derivative are made into 15 to 25 weight section, and run short of fire-resistant effects by less than

ten weight sections, and if 30 weight sections are exceeded, hardness etc. will fall. [0012]1-5 weight-section combination of the hydrotalcite may be carried out to high-density-polyethylene 100 weight section if needed. A hydrotalcite is a magnesium aluminum hydroxide carbonate hydrate, and is known as an inorganic filler, and combustion melt is prevented from trickling when this flame retardant resin composition burns by blending this. If a combustion melt dropping preventive effect is not acquired by less than 1 weight but the loadings of a hydrotalcite exceed five weight sections, the mechanical property of a resin composition will fall.

[0013]Since combination of fire retardant and a fire-resistant auxiliary agent reduces mechanical properties, such as tensile strength of a flame retardant resin composition, elongation, hardness, and flexural strength, these loadings consider balance with the fire retardancy demanded in consideration of the tolerance of the fall, are in a mentioned range and will be decided suitably.

[0014]Additive agents, such as antiaging agents, such as a phenol system antiaging agent, an ultraviolet ray absorbent, colorant, and an inorganic filler, may be suitably blended with the flame retardant resin composition of this invention if needed. Ten or less weight sections of boric acid compounds, such as silicone series fire retardant, such as silicone powder and silicone gum, zinc borate, and manganese borate, etc. can be blended, and fire retardancy can be improved, or the quantity of the loadings of a phosphorus series flame retardant can also be decreased.

[0015]Below the amount part of duplex blends the cross linking agent which consists of organic peroxide, such as dicumyl peroxide, and it is made to carry out after shaping heating bridge construction. Five or less weight sections of acrylic polyfunctional monomer, such as trimethylolpropane triacrylate and triaryl cyanurate, is blended, and it is made to carry out after shaping electron beam bridge construction. Fire retardancy improves by performing such bridge construction, and a mechanical strength also improves further.

[0016]The mold goods of this invention are fabricated and obtained by various forming processes which can apply an above-mentioned flame retardant resin composition to thermoplastics, such as injection molding and extrusion molding. The shape is arbitrary and it can respond to the shape demanded [film / the conduit tube, a wire connection protective cover, a pipe, a board, a sheet,] easily. The thing which carried out secondary forming, such as carrying out vacuum forming of a board, a sheet, and the film, is also contained.

[0017]Mechanical properties, such as tensile strength, elongation at the time of a fracture, flexural strength, and hardness, are a rigid-polyvinyl-chloride resin material and more than equivalent, and the flame retardant resin compositions of this invention are a fire-resistant mist beam rigid-polyvinyl-chloride resin material and more than equivalent, and demonstrate the fire retardancy which passes the burning test of 94 V-O specified to UL.

[0018]Since a halogen is not contained in a resin composition, a halogenated compound harmful in the case of combustion of this is not generated, and environment is not polluted even if it carries out incineration disposal of the mold goods of this. In the flame retardant resin composition which blended the hydrotalcite, when this resin composition burns, combustion melt does not trickle and fire retardancy does not fall by this dropping thing burning.

[0019]Hereafter, an example is shown. The flame retardant resin composition of the

combination presentation (it displays by a weight section) shown in Table 1 and 2 was prepared, extrusion molding of this was carried out, and the 0.8-mm-thick sheet was manufactured. About this sheet, a burning test, tensile strength, the elongation at the time of a fracture, flexural strength, and hardness (Shore D) were measured. A burning test is UL94, 20MM It carried out according to the vertical flame test, and what fulfills the standard of 94 V-O was considered as success.

[0020]In Table 1 and 2, allylisocyanuric acid was used for the isocyanuric derivative at high density polyethylene using the thing of density 0.955g/cm^3 and the melt flow rate 0.07. The phenol system antiaging agent was used for the antiaging agent. A result is shown in Table 1 and 2.

[0021]

[Table 1]

テスト番号	1	2	3	4	5	6	7	8	9
高密度ポリエチレン	100	100	100	100	100	100	100	100	100
ホリリン酸アンモニウム	45	100	45	100	70	40	120	100	—
イソシアヌル誘導体	10	10	30	30	15	5	35	—	30
老化防止剤	1	1	1	1	1	1	1	1	1
燃焼試験	合格	合格	合格	合格	合格	不合格	合格	不合格	不合格
引張強度(MPa)	21.3	17.3	18.5	15.0	17.4	22.4	8.0	16.0	22.0
伸び(%)	52	20	45	23	31	59	10	27	62
曲げ強度(MPa)	27.5	26.4	26.2	25.0	25.1	27.5	24.0	25.0	27.5
硬度(ショアD)	66	69	68	66	65	64	69	67	68

[0022]

[Table 2]

テスト番号	10	11	12	13	14	15	16
高密度ポリエチレン	100	100	100	100	100	100	100
ホリリン酸アンモニウム	70	70	70	—	—	45	100
イソシアヌル誘導体	15	15	15	—	—	10	30
ハイドロタルサイト	3	5	8	—	—	5	3
水酸化マグネシウム	—	—	—	200	100	—	—
老化防止剤	1	1	1	1	1	1	1
燃焼試験	合格	合格	合格	不合格	不合格	合格	合格
引張強度(MPa)	17.9	17.6	17.5	9.2	12.0	20.2	15.0
伸び(%)	29	28	28	7	11	55	26
曲げ強度(MPa)	25.6	26.2	26.1	27.0	26.5	27.2	28.2
硬度(ショアD)	67	66	67	69	68	65	68

[0023]The result of Table 1 and 2 shows that sufficient fire retardancy is acquired by using together a phosphorus series flame retardant and an isocyanuric derivative. It

became clear by making high density polyethylene into base polymer for tensile strength, elongation, flexural strength, hardness, etc. to have been able to acquire a rigid-polyvinyl-chloride resin material and the mechanical property more than equivalent.

[0024]

[Effect of the Invention]If it is in the flame retardant resin composition of this invention, fire retardancy, a mechanical strength, hardness, etc. become a rigid-polyvinyl-chloride resin material and more than equivalent, and as explained above, since it is moreover non halogen, effects, such as not generating a halogenated compound harmful at the time of combustion, can be acquired. In what blended the hydrotalcite, combustion melt does not trickle at the time of combustion, and fire retardancy is improved by this.

TECHNICAL FIELD

[Field of the Invention]It is made for this invention to have fire retardancy equivalent to especially a rigid-polyvinyl-chloride resin material, a mechanical strength, and hardness about the flame retardant resin composition of a non halogen system.

EFFECT OF THE INVENTION

[Effect of the Invention]If it is in the flame retardant resin composition of this invention, fire retardancy, a mechanical strength, hardness, etc. become a rigid-polyvinyl-chloride resin material and more than equivalent, and as explained above, since it is moreover non halogen, effects, such as not generating a halogenated compound harmful at the time of combustion, can be acquired. In what blended the hydrotalcite, combustion melt does not trickle at the time of combustion, and fire retardancy is improved by this.